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STUDY II--EFFECTS OF EXPERIMENTAL TEACHING ON THE VISUAL BEHAVIOR OF CHILDREN EDUCATED AS THOUGH THEY HAD NO VISION.

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THE SPECIFIC OBJECTIVES OF THE STUDY WERE TO CONFIRM (1) THAT A SHORT PERIOD OF EXPERIMENTAL TEACHING ENHANCES THE VISUAL BEHAVIOR OF PARTIALLY SIGHTED CHILDREN TO THE EXTENT THAT THERE ARE SIGNIFICANT INCREASES IN VISUAL DISCRIMINATION TEST SCORES AND (2) THAT THERE IS A SIGNIFICANT INCREASE IN RECORDED NEAR-VISION ACUITY OF EXPERIMENTAL SUBJECTS AS DETERMINED BY AN OPHTHALMOLOGIST. THIS WAS A REPETITION OF AN EARLIER EXPERIMENT. EXPERIMENTAL GROUPS WERE CONSTITUTED AT SCHOOLS FOR THE BLIND IN KENTUCKY, TENNESSEE, AND VIRGINIA. CONTROL GROUPS WERE CONSTITUTED IN ARKANSAS, ILLINOIS, AND TEXAS. TEACHERS WERE GIVEN LESSON PLANS AND OTHER MATERIALS, AND WERE INSTRUCTED IN THE USE OF THESE MATERIALS. SIGNIFICANT GAINS IN VISUAL FUNCTIONING AS MEASURED BY THE VISUAL DISCRIMINATION TEST RESULTED FROM THIS STUDY. THUS, POSITIVE FINDINGS OF THE PREVIOUS STUDY WERE CONFIRMED. (LP)

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Study II: Effects of Experimental Teaching On the Visual Behavior of Children Educated As Though They Had No Vision

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TABLE OF CONTENTS

	Page
Problem	1
Objectives	1
Related Research and Background Information	2
Procedure	5
Analysis of the Data and Findings	12
Conclusions and Discussion	18
Supplementary Bibliography	20
Appendix A	23
Appendix B	30

TABLES AND FIGURES

		Page
Table 1	Comparison of Experimental and Control Groups on Significant Variables, Beginning of Study	10
Table 2	Comparison of Experimental and Control Groups, Visual Discrimination Test Scores	11
Table 3	Analysis of Variance Summary Table Total Visual Discrimination Test Score	12
Table 4	Analysis of Variance, Subtests I and III	13
Table 5	Analysis of Variance, Subtest II	14
Table 6	Means and Standard Deviations of Experimental and Control Groups on Pre- and Post-Test Measures	15
Figure I	Mean Gain on Pre-Test, Post-Test Scores of Experimental and Control Groups -- Total and Subtest Scores on Visual Discrimination Tests	16
Figure II	Mean Pre- and Post-Test Scores of Experimental and Control Groups -- Subtests I, II, and III and Total Test (Subtests combined) for Eight Week Experimental Interval	17

PROBLEM

Many children who come within the definition of blindness for legal purposes have learned to use their remaining vision to some extent without special training or assistance. There has long been a question of whether a special training program would accelerate, enhance, and facilitate the functional use of residual vision for children with very small degrees of remaining vision. Barraga (1964) undertook a pioneering study titled the Effects of Experimental Teaching on the Visual Behavior of Children Educated as Though They Had No Vision to answer this and related questions. That study demonstrated that a short term intensive teaching program significantly improved the visual efficiency of young, low-vision children. The study provided objective evidence regarding the value of the recommended visual stimulation program for blind children with remaining vision.

Characteristically, research interest palls following a single study of a problem. As a result, there is little integration of research findings and too rarely are significant studies replicated or extended in scope as a means of answering questions invariably raised by discrete projects in research. The present replication was proposed in order to provide additional evidence regarding the efficacy of the experimental approach and the teaching that was utilized.

OBJECTIVES

The present investigation attempted to confirm by replication the gains in visual functioning found in the previous study which were attributed to the short term (eight weeks) intensive teaching procedure. The present study sought answers to such questions as:

> Could comparable results be achieved with a different group of similar children?
>
> Could other investigators obtain comparable results using the same experimental teaching approach?

The specific objectives of the present study were to confirm: (1) that a short period of experimental teaching enhances the visual behavior of blind children with remaining vision to the extent that there are significant increases in visual discrimination test scores; (2) that there is a significant increase in recorded near vision acuity of experimental Ss as determined by an ophthalmologist.

The replication of this study was considered desirable also to determine the feasibility and efficacy of extending the treatment more to general practice with such children.

RELATED RESEARCH AND BACKGROUND INFORMATION

Barraga's (1964) review of research was up-to-date at the time of her study. Since the study was published and is widely available, the review is not reproduced extensively in this report. Instead the present review of research provides a brief synopsis of the published review, adds a supplementary bibliography of related literature and presents an extensive summary of the previous study.

The literature on vision indicates that the visual process matures developmentally in spite of eye anomalies (Gesell, 1959; Law, 1960). Eye specialists (Bier, 1960; Ehlers, 1953; Hildreth, 1957) have concluded that visual acuity has no one fixed value, but varies in individuals. Children with low degrees of vision develop functional vision through learning. From her analysis of the literature and previous research, Barraga assumed that children with low vision might make significant progress in their ability to conceptualize from visual experience in terms of their intellectual ability even though they had serious end organ visual defects. This assumption was inferred from such work as Brown's (1961) which suggests that one must be prepared to use vision by the "input and confirmation of information from the environment" and that "visual response is to a considerable degree, a learned response."

The subjects in the previous (Barraga, 1964) experiment included ten pairs of children with small degrees of remaining vision matched on a test of visual discrimination which had been developed by adaptation and enlargement from the types of items found in materials used to develop or appraise reading readiness. The Visual Discrimination Test (VDT) developed by Dr. Barraga (1964) measures ability to recognize and to discriminate reading readiness types of test items which have been enlarged and adapted for children with small degrees of remaining vision. The test, including three subtests, utilizes items of progressive difficulty and diminishing size, in: discriminating likenesses and differences; matching forms and objects; differentiating size order; determining relationships between objects; finding missing parts; integrating parts of objects, pictorially and symbolically; recognizing and identifying objects and symbols.

The VDT was developed and validated by item analysis procedures and in terms of a developmental concept of visual discrimination, the content of items, and concurrent judgments by teachers. Evidence of high reliability was obtained by test-retest (r=.96) and split half (r=.97) methods.

The children who served as experimental subjects had not been previously exposed to formal instruction in visual discrimination and recognition of visual forms or symbols. A "print comparison" group of children with slightly more vision who had learned to function visually was included as a criterion group.

Experimental subjects selected for the investigation were between CA six and 13, had individual intelligence test scores above 80 and were placed in grades one through five in a residential school for the blind which they had attended since first grade. They were free of known abnormalities other than vision.

The experimental children were instructed daily, in groups of two, for 45-minute periods during the eight weeks treatment. The program of lessons provided stimulation for development and improvement in using remaining vision. Children were encouraged to "learn to see" and to communicate in terms of the visual stimulation. Each lesson included a review of previous lessons before new material was introduced. The program was planned to provide for general development in using vision rather than remediation of specific visual disabilities.

The program placed emphasis on interpretation and communication of information acquired through visual observations. Lesson materials and plans were developed around four sequential stages of ability in discrimination and recognition; geometric forms, single object forms, grouped objects in color, and letter and word symbols. The size of materials was decreased gradually from two inches to one-fourth inch and finally, where possible, to reading material in large print type-size. The quality of abstraction of the materials was also increased gradually. Daily evaluation was made by the investigator using observations and ratings.

Visual Discrimination Test scores constituted the data for determining the effects of the treatment. The test data were submitted to analyses of variance to assess the significance of individual and group differences. Gains in post-test over pre-test scores were obtained by the experimental group with substantial gains being made by all but one of the subjects. There were significant differences in gains for the experimental and control groups. Eight of the ten experimental children achieved gains greater than their matched control counterparts. A significant difference was also found when gain scores for the experimental and "print comparison" groups were compared.

Acuities for near vision, obtained by an ophthalmologist, were used to determine if measurable differences would be associated with changes in visual behavior. The post experiment near acuity ratings of three experimental children were equal to or greater than those of some children in the print comparison group, but this difference was not significant. Though the data failed to provide evidence that near vision acuities increased significantly, children with the least vision gained more than those with more vision.

Analysis of the pre- and post-test scores provided additional evidence regarding reliability of the Visual Discrimination Test. Pre- and post-test scores separated by two months gave a test-retest correlation coefficient of .98.

The study provided objective evidence that children with low degrees of remaining vision (6/200 or less) could improve significantly in visual efficiency. The study encouraged further investigation of the hypothesis given highest priority by the conference on research related to the education of visually handicapped children, "that children with all degrees of residual vision can achieve greater visual efficiency," (U.S. Department of Health, Education, and Welfare, 1961, p. 5).

PROCEDURE

Subjects. As in the original study, the present investigation included experimental and control groups. The subjects were selected with regard to the following criteria:

1. age - six to 13 years
2. grade placement - first through fifth
3. IQ - 70 and above (as measured, where possible, within the last two years by means of the Interim-Hayes-Binet Intelligence Test or the Wechsler Intelligence Scale for Children - verbal scale only)
4. instructed as braille readers from first to present grade placement

5. instructed in the classroom with other than visual materials
6. judged ophthalmologically as having not less than "object perception" (or "counts fingers" ability or "light perception") up to no greater than 6/200 or 8/200 vision in the better eye (corrected) with the impairment resulting from conditions present at birth and with a prognosis of no improvement
7. free from other known impairments which might present additional problems for learning

Experimental groups were constituted at schools* for the blind in Kentucky (eight children), Tennessee (negro and white) (five and six children), and Virginia (five children). Control groups were constituted at Arkansas (five), Illinois (three) and Texas (nine). One other school agreed to participate but failed to provide data.

It will be noted here that the present investigation included several departures from the previous study with respect to subjects and school settings.

	Present Study	Previous Study
IQ limit	70	80
Visual acuity limit	8/200	6/200
Race	White & Negro	White only
Experimental settings	Four schools (Tennessee, 2; Kentucky, Virginia)	One school (Tennessee)
Control group settings	Three schools (Arkansas, Illinois, Texas - one school failed to keep its commitment to cooperate)	One school (Illinois)

Most of these departures were considered in consultation with Dr. Barraga and based on empirical observations in the prior study. She was especially encouraging about lowering the IQ limit, expanding the number of locations, and including Negro children. Other considerations motivated additional changes such as the availability of subjects and instructors and the willingness and ability of schools to cooperate.

* The investigators wish to acknowledge the generous assistance of the personnel in these schools.

Instructors. Teachers were selected with care for each of the experimental groups. The teachers at the Tennessee School for the Negro Blind and at the Virginia School were regular members of the respective faculties given released time for their participation in the study. The teacher at the Virginia School was especially suited to the task, not only for her competence and interest, but also because she had provided assistance in the previous study while in graduate study at Peabody College. In all four cases, the teacher selection was based on interest in children and the project; understanding children and the nature of the program to be implemented; familiarity with readiness materials and their use with pre-reading children; and their philosophy and enthusiasm for teaching. The research assistant who was responsible for implementing details of the study (Carol Halliday, a Peabody graduate who had also assisted in the previous study) provided appropriate orientation to the study, recruited the teachers and gave training regarding lesson plans, instruction, materials, and record keeping.

Teachers were provided modest honoraria for their participation in the study. These honoraria were not commensurate with the extra responsibility, time and effort which were required.

Treatment. The 44 lesson plans developed and utilized in the previous study constituted the core of the treatment. Each instructor was provided with a complete set of the plans as they were written in the original dissertation. The teachers were given instruction in the use of the materials. Though they were encouraged to follow the lesson plans with care they were also encouraged to use discretion in supplementing or departing appropriately from them. The experimental treatment program spanned approximately eight school weeks. Daily lesson periods ranged from 30 to 45 minutes and involved two (or occasionally three children) at a time, although some single-child sessions were necessary in cases of absence or scheduling problems.

The instruction was general in nature rather than specifically geared to diagnostic analyses or weaknesses revealed by the discrimination test. Instructors were not informed about the pre-test scores of the children.

Instructional sessions occurred during the school day and were scheduled at the optimum time from the standpoint of the children's schedules and the availability of the instructor.

In the instructional sessions emphasis was placed on establishing rapport, providing motivation and stimulation and eliciting verbal communication in response to the visual stimulus materials. Settings for teaching were provided which were conducive to the effective use of residual vision and to a good working relationship with the materials and teachers.

Teachers made records of the children's progress and reactions to the instruction and materials. They also evaluated the materials in terms of the children's interest in and use of them. The teachers obtained or made additional materials they felt would enhance the lessons and instruction.

Materials. The materials utilized in the original study were largely handmade by the investigator. In order to provide uniformity among the experimental programs, kits of materials were assembled largely from commercial sources. Identical kits were provided each of the four teachers, but the instructors were encouraged to supplement with materials of their own choosing which they felt might be especially helpful.

A list of the kit materials is found in Appendix B.

Measures for evaluation. The following types of data were obtained on the experimental and control subjects :

Chronological ages, grade, IQ (recent Interim Hayes Binet or Wechsler Intelligence Scale for Children - verbal scale only) pre- and post-test scores on the visual discrimination test, distance and near

visual acuity (current or recent ophthalmological examination--pre- and post-experiment), attendance, teacher observations.

Several kinds of data available in the original study were not obtained in the present study, but this was not considered detrimental to the replication. These were: lateral dominance (obtained, but not analyzed in original study); Gates Primary Reading Test results (reported for some children who scored high on the Visual Discrimination Test post-testing in the original experiment--three of the 24 experimental children in the present study scored above 50 on the post-test). Finally, no print comparison group was obtained in this study since the major purpose of this added control group in the original experiment was to obtain data on validity and reliability of the Visual Discrimination Test.

Characteristics of Experimental and Control Groups. Table 1 provides information for a description and comparison of the experimental and control groups on significant variables at the beginning of the study. These summary data are derived from the more complete table on individual subjects in Appendix A.

Table 1 shows that there were 24 experimental subjects and 17 control subjects. While the original study utilized 10 children and 10 controls paired on visual discrimination pre-test scores, such exact pairing was not considered necessary in the larger present study. As will be seen in the analyses of results, the same method of analysis is employed and no loss of precision is entailed. Indeed, while the matching enhanced the rigor and scholarliness of the initial study, it was not essential to the demonstration of significant results. One advantage of the matching achieved in the original study not here available is the balance of females and males.

TABLE 1

Comparison of Experimental and Control
Groups on Significant Variables
Beginning of Study

		Experimental	Control
Number		24	17
Males		9	7
Females		15	10
Age (in months)		115.0	118.5
Range (in months)		76-144	83-126
Standard deviation		19.65	21.77
IQ		89.9 (N=18)	105.4 (N=12)
Range		72-111	90-126
Standard Deviation		12.4	12.37
Grade Placement	K	1	0
	1st	11	4
	2nd	5	3
	3rd	5	3
	4th	1	4
	5th	1	3
Range		K - 5	1 - 5
Mean		1.8	2.9

It will be noted that the mean age of the experimental group is approximately three months below that of the control group. This age difference "stacked the cards" in favor of the control group and provides ancillary evidence to support the conclusion that the resulting statistical differences between the groups were real differences in visual discrimination. The same rationale appears to apply to the difference favoring the control group in intelligence and grade placement.

Table 2 provides a comparison of the experimental and control groups on the pre, post, and difference mean test scores of the Visual Discrimination Test. It will be noted that the experimental group mean on the pre-test was about five points below that of the control group but that the experimental post-test mean exceeded the controls by more than two points. Experimental subjects averaged gains of almost ten points while controls averaged about three points.

TABLE 2

Comparison of Experimental and Control Groups
Visual Discrimination Test Scores

	Experimental	Control
Pretest Mean	29.5 (N=24)	34.4 (N=17)
Range	11.0 - 47.0	9.0 - 53.5
Standard Deviation	10.46	15.8
Post-test Mean	39.4	37.2
Range	13.0 - 56.5	10.0 - 53.0
Standard Deviation	10.84	16.52
Difference Mean	9.58	2.7
Range	-10.5 to +22.5	-2.0 to +10.5
Standard Deviation	8.45	3.1

The experimental group averaged 36.1 days in attendance during the lessons with a range of from 18 - 42 days. Thirteen subjects were present 39 - 41 days, six subjects from 34 - 37 days, three subjects from 25 - 30 days and one subject each present 18 and 42 days.

ANALYSIS OF THE DATA AND FINDINGS *

The data in this study consist of scores from pre- and post-experiment administrations of the Visual Discrimination Test. The pre- and post-test scores of the experimental and control groups are presented in Appendix A. The data were analyzed in terms of the type I analysis of variance procedures (Lindquist, 1953, page 267-272). This analysis provides a test of the significance of the difference in pre- and post-test scores for the two groups combined as a test of possible differential gains for the two groups. Using the total score on the three subtests which comprise the visual discrimination test the analysis revealed a significant difference in the pre- and post-test scores of the total group, with the post-test score being significantly higher than the pre-test score. There was, however, interaction between the two test measures and the experimental and control conditions indicating that the magnitude of the gain was different for the experimental and control conditions. Separate t tests for the experimental and control groups revealed that the gain differential was in favor of the experimental subjects.

TABLE 3

Analysis of Variance Summary Table
Total Visual Discrimination Test Score

Source	df	Ex^2	MS	F
Between Ss	40	12759.49		
Treatment	1	40.57	40.57	
error (B)	39	12718.92	326.13	
Within Ss	41	2121.50		
Time	1	962.94	962.94	41.33*
Time x treatment	1	249.81	249.81	10.72*
error (W)	39	908.75	23.30	
Total	81	14880.99		

Simple Effects:

$t_e = 9.79/1.39 = 7.04^*$, df = 23

$t_c = 2.71/1.66 = 1.63$, df = 16

* $< .05$

* Dr. James Terwilliger of Peabody College provided the statistical analyses for the study.

Separate analyses were made of gain scores for each of the three subtests of the Visual Discrimination Test. The results of the analyses of Subtest I and Subtest III* were the same as those obtained for the total test scores. On Subtest I there was a significant difference in the pre- and post-test scores of the total sample and also a significant interaction between time and treatment indicating different degrees of gain in the two groups. Statistical tests of mean differences within each group indicated that the gain was statistically significant in the experimental group but not for the group in the control condition. The same general result was obtained in the case of Subtest III. The details of the analyses are presented in Table 4.

TABLE 4

Analysis of Variance

Subtest III

Source	df	Ex^2	MS	F
Between Ss	40	2342.95		
Treatment	1	23.94	23.94	
error (B)	39	2369.01	60.74	
Within Ss	41	429.00		
Time	1	158.49	158.49	
Time x treatment	1	52.32	52.32	28.35*
error (A)	39	218.19	5.59	9.36*
Total	81	2821.95		

Simple Effects:

t_e = 4.12/.68 = 6.06*, df = 23

t_c = .88/.81 = 1.09 , df = 16

Subtest I

Between Ss	40	437.44		
Treatment	1	.01	.01	
error (B)	39	437.43	11.22	
Within Ss	41	87.50		
Time	1	34.26	34.26	31.72*
Time x treatment	1	11.27	11.27	10.44*
error (W)	39	41.97	1.08	
Total	81	524.94		

Simple Effects:

t_e = 1.91/.3 = 6.37*, df = 23

t_c = .41/.36 = 1.14 , df = 16

* $p < .05$

* A rounding convention was used for Subtest III and total scores involving half points. The convention was: when the preceding number was odd, half-point scores were rounded up (e.g., 9.5 was rounded to 10.0); when the preceding number was even, half-point scores were rounded down (e.g., 8.5 was rounded to 8.0).

An analysis of the pre- and post-test scores of the experimental and control groups on Subtest II again showed a significant over-all difference in the pre- and post-test scores of the experimental and control groups combined. However, there was no significant interaction between the two test measures and the experimental and control conditions on Subtest II, so it was not possible to conclude that there was a differential gain in the two groups considered separately.

TABLE 5

Analysis of Variance

Subtest II

Source	df	Ex^2	MS	F
Between Ss	40	2301.05		
Treatment	1	1.04	1.04	
error (B)	34	2300.01	58.98	
Within Ss	41	597.00		
Time	1	169.81	169.81	16.73*
Time x treatment	1	31.21	31.21	3.07
error (W)	39	395.98	10.15	
Total	81	2898.05		

* $p < .05$

Figure 1 provides a graphic comparison of the gains made by the experimental and control groups from pre-testing to post-testing. Table 6 gives the means and standard deviations of the pre- and post-test measures on each subtest separately and on the pre-and post-test measures of the three subtests combined.

A chi-square test of the pre and post experiment near visual acuity measures failed to reveal any significant changes.

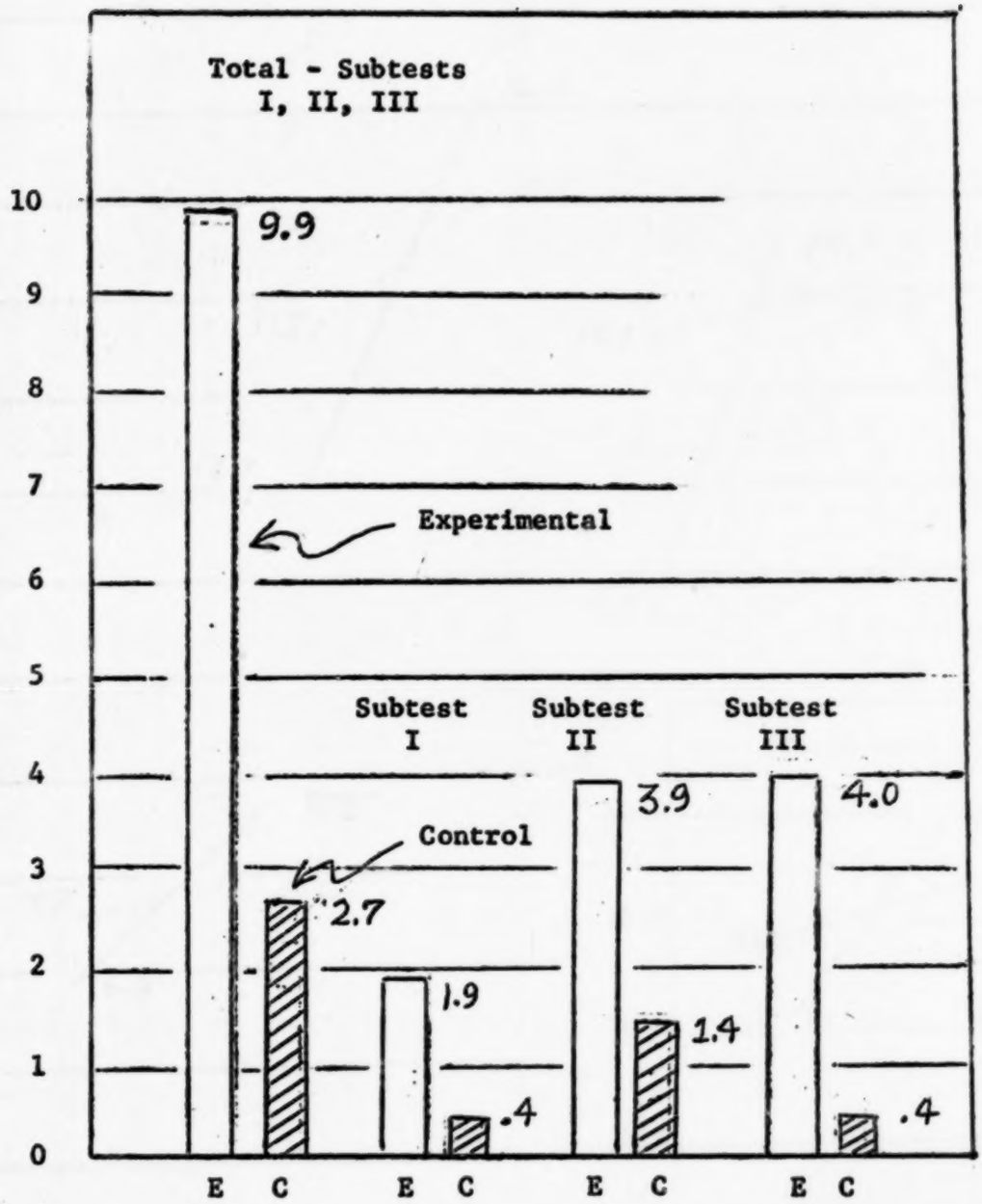
The present study provides additional information on the reliability of the Visual Discrimination Test. The test-re-test coefficients of correlation were 68.5 for the experimental group and 98.5 for the control group.

TABLE 6

Means and Standard Deviations of Experimental and Control Groups on Pre- and Post-Test Measures

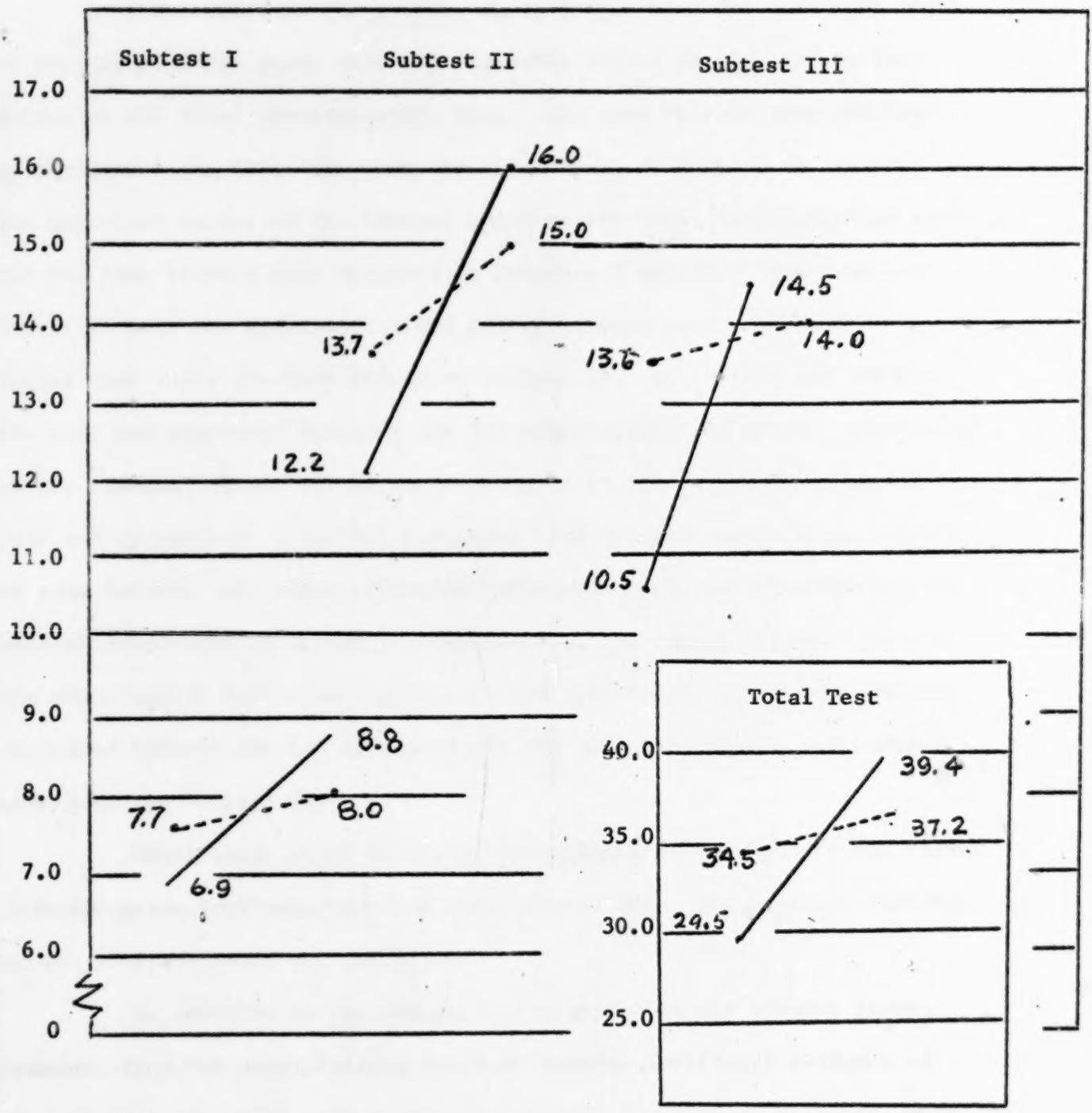
	Subtest I				Subtest II				Subtest III				Total I II III			
	Pre		Post		Pre		Post		Pre		Post		Pre		Post	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
E	6.88	2.36	8.79	1.84	12.17	4.56	16.08	5.46	10.47	4.74	14.50	4.55	29.52	10.46	39.38	10.84
C	7.65	2.74	8.06	3.09	13.65	6.81	15.06	7.03	13.64	7.12	14.06	6.90	34.47	15.84	37.18	16.52

Figure I



Mean gains on pre-test--post-test scores of experimental and control groups -- Total and Subtest scores on Visual Discrimination Tests

Figure II



Mean Pre- and Post-Test scores of experimental and control groups - Subtests I, II, and III and Total Test (Subtests combined) for eight week experimental interval

CONCLUSIONS AND DISCUSSION

The results of the present study reveal that the post-test scores of the experimental group were significantly higher than their pre-test scores on the total discrimination test. The same results were obtained on Subtests I and III. There was no significant difference in the pre- and post-test scores of the control group on the total discrimination test and the same results were obtained on Subtests I and III. The post-test scores of both the experimental and control groups were significantly higher than their pre-test scores on Subtest II. An interaction between the pre- and post-test measures and the experimental and control conditions on the combined scores of the three subtests on the Visual Discrimination Test and on Subtests I and III indicates that in each instance the factor of time between test administrations interacted with the experimental and control conditions to affect the magnitude of the scores obtained by both the experimental and control groups on the post-test. No interaction was indicated between the two test measures and the experimental and control conditions on Subtest II.

Significant gains in visual functioning as measured by the Visual Discrimination Test resulted from this study. Thus, the positive findings of the previous study are confirmed.

In addition to the statistical findings in the present study, comments from the participating teachers provide additional evidence of the validity of visual stimulation activities. Among such reactions were the following:

1. All children completed the program with increased confidence in their ability to use their vision for learning.

2. Motivation of the children and the progress they made suggested the need for a continuing program of this nature.

3. The program was terminated just as some children were approaching consistent interest and progress, indicating that individual factors influence the rate and degree of progress.

Recommendations

1. Pilot programs should be developed integrating stimulation in visual discrimination into curricula in programs for visually handicapped.

2. The Visual Discrimination Test should be further developed to extend its range.

3. Other means and other instruments for evaluating progress in visual discrimination should be identified.

4. Additional guidelines for curricula in this area should be developed--that is the lessons should be expanded, the materials supplemented, and the teaching procedures further delineated.

5. Attempts should be made to extend the program both downward to younger age levels and upward to older age levels.

6. Application should be extended to children with all degrees of vision loss.

7. The program should be studied for its usefulness with children who have additional handicaps.

8. Research should be undertaken to develop diagnostic procedures for specific types of visual disabilities and to provide specific approaches to treatment in terms of diagnoses.

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APPENDIX A
Experimental

Name	Age	Grade	IQ	Pre	Post	Difference	Distance Vision r	Distance Vision l	Near Vision Before r	Near Vision Before l	Near Vision After r	Near Vision After l	Attendance
T.T.	7-9	1	83	7	7	0	nil	CF	---	2/140	---	3/140	40
				14	17	+3							
				9.5	8.5	-1							
				30.5	32.5	+2							
J.D.	10-5	3B	89	9	11	+2	1/200	nil	4/140	---	2/140	nil	39
				16	15	-1							
				14.5	15	+.5							
				39.5	41	+1.5							
P.H.	8-6	1	88	7	8	+1	3/200	1/200	14/140	7/140	12/140	7/140	39
				13	18	+5							
				13	16	+3							
				33	42	+9							
R.A.	7-10	1	80	2	9	+7	M.O.	M.O.	---	2/140	L.P.	C.F.	39
				5	12	+7							
				5	10	+5							
				12	31	+19							
J.M.	6-7	1	80	7	8	+1	CF at 6'	CF at 6'	3/140	3/140	3/140	?	39
				18	18	0							
				12.5	13.5	+1							
				37.5	39.5	+2							
M.B.	12	5	109 IHB	9	8	-1	3/200	nil	not measurable		can't see any near object at any distance		25
				13	5	-8							
				8.5	7	-1.5							
				30.5	20	-10.5							

APPENDIX A
Experimental

Name	Age	Grade	IQ	Pre	Post	Difference	Distance Vision r	Distance Vision l	Near Vision Before r	Near Vision Before l	Near Vision After r	Near Vision After l	Attend-ance
B.H.	7-10	1	80	6	9	+3	CF	nil	15/140	---	0/140	---	39
			IHB	12	16	+4							
				13	13	0							
				31	38	+7							
M.H.	8-4	1	below	10	11	+1	obj. P.	L.P.	not measurable		2/140	0/140	34
			72	20	22	+2							
			IHB	11.5	17.5	+6							
				41.5	50.5	+9							
J.W.	6-4	1	93	6	8	+2	3/200	3/200	5/140	5/140	10/140	10/140	39
			IHB	9	21	+12							
				9.5	16	+6.5							
				24.5	45	+20.5							
J.V.	8-11	2	72	4	5	+1	L.P.	CF	not measurable		can't see any near object at any distance		39
			WISC	9	10	+1							
				8	13.5	+5.5							
				21	28.5	+7.5							
G.H.	7-4	1	104	9	11	+2	L.P.	L.P.	2/140	6/140	7/140	9/140	40
			IHB	15	20	+5							
				16	18	+2							
				40	49	+9							
L.W.	8-6	2	92	4	7	+3	L.P.	HM	no useful near vision		HM 1' slight change	HM 1'	37
			HB	13	1	-12							
			'63	3	5	+2							
				20	13	-7							

APPENDIX A
Experimental

Name	Age	Grade	IQ	Pre	Post	Difference	Distance Vision r	Distance Vision l	Near Vision Before r	Near Vision Before l	Near Vision After r	Near Vision After l	Attendance
G.D.	9-11	3	97	5	8	+3	CF 5' (without correction)	CF 5' (without correction)	20/200 (poor) (with correction)	20/200 (slow) (with correction)	CF 3' less	HM 1' less	40
			HB	6	19	+13							
			'62	14	18	+4							
				25	45	+20							
C.L.	10-7	1	77	3	6	+3	HM 2'	L.P.	no useful near vision		HM 2' same	L.P. same	39
			Hayes	5	11	+6							
			'63	3	11	+8							
				11	28	+17							
E.H.	10-5	2	80	7	11	+4	CF1'	CF1'	no useful near vision		HM ? less	HM ? less	30
			HB	12	23	+11							
			'61	15	22.5	+7.5							
				34	56.5	+22.5							
S.D.	10-4	3	111	9	10	+1	HM 6"	CF 18"	cyclogyl, high + does not improve near VA		HM 5" (slight change)	CF 19"	36
			WISC	14	21	+7							
			'64	11	15.5	+4.5							
				34	46.5	+12.5							
P.S.	9-10	3	95	10	11	+1	HM 4"	CF 8"	without correction read Jaeger line 12 at 3" (poor)		HM 4"	CF 8"	40
			HB	19	22	+3							
			'62	14	21	+7							
				43	54	+11							
L.H.	11-7	3	111	7	10	+3	HM 4"	CF 10"	cyclogyl, high + does not improve near VA		HM 4"	CF 10"	35
			WISC	15	19	+4							
			'64	14.5	19.5	+5							
				36.5	48.5	+12							

APPENDIX A
Experimental

Name	Age	Grade	IQ	Pre	Post	Difference	Distance Vision r	Distance Vision l	Near Vision Before r	Near Vision Before l	Near Vision After r	Near Vision After l	Attendance
R.Y.	10-5	1	78	6	9	+3	L.P.	no L.P.	no useful near or distance vision		HM 1' (better)	CF 7"	18
			HB	4	11	+7							
			'63	3	10	+7							
				13	30	+17							
R.C. (1 of last 5)	12	4	*	11	11	0	no L.P.	L.P.	no L.P.	20/800		20/800	41
				17	19	+2							
				19	21	+2							
				47	51	+4							
D.H.	7-4	1	*	5	7	+2	L.P.		less than 20/800	less than 20/800	less than 20/800	less than 20/800	29
				7	17	+10							
				3	11	+8							
				15	35	+20							
J.R. (2 of last 5)	10-3	2	*	8	10	+2	measles		20/800	20/800	20/800	20/800	36
				9	16	+7							
				9	14	+5							
				26	40	+14							
B.R. (1 of last 5)	9-3	2	*	9	10	+1	CF 2'	no L.P.	20/800	no L.P.	20/800	no vision	42
				15	19	+4							
				16	18	+2							
				40	47	+7							
L.J.	10-3	KDG	*	5	6	+1	HM		less than 20/800	20/800	absent all week couldn't check		34
				12	14	+2							
				6	13.5	+7.5							
				23	33.5	+10.5							

* Not available

APPENDIX A
Control

Name	Age	Grade	IQ	Pre	Post	Difference	Distance Vision r	Distance Vision l	Near Vision Before r	Near Vision Before l	Near Vision After r	Near Vision After l
N.S.	8-5	2	121	6	8	+2	HM 2'	HM 2'	1/14		1/14	
				6	8	+2						
				12	9	-3						
				24	25	+1						
J.C.	7-2	1	126	8	10	+2	7/200	CF 2'	5/14		3/14	
				21	21	0						
				14.5	19	+4.5						
				43.5	50	+6.5						
D.A.	9-4	2	95	8	8	0	HM 6'	HM 6'	3/14		1/14	
				12	12	0						
				11	12	+1						
				31	32	+1						
M.G.	11-7	5	116	1	2	+1	3/200	1/200	0/14		0/14	
				3	7	+4						
				6	3	-3						
				10	12	+2						
L.R.	11-5	5	110	7	8	+1	2/200	2/200	4/14		2/14	
				16	16	0						
				17	14	-3						
				40	38	-2						
J.D.	8-6	1		10	11	+1	CF 3'	HM 1'	5/70		5/14	
				20	22	+2						
				19	16	-3						
				49	49	0						

APPENDIX A
Control

Name	Age	Grade	IQ	Pre	Post	Difference	Distance Vision r	Distance Vision l	Near Vision Before r	Near Vision Before l	Near Vision After r	Near Vision After l
T.B.	10-10	4	90	10	10	0	CF 3'	CF 3'	3/14		2/14	
			17	17	21	+4						
				21.5	18	-3.5						
				48.5	49	+ .5						
T.A.	9	3	96	9	9	0	CF 3'	CF 3'	2/14		3/14	
				17	20	+3						
				16.5	18.5	+2						
				42.5	47.5	+5						
G.M.	9-5	2	91	10	9	-1	1/200	1/200	3/14		0/14	
				11	15	+4						
				14.5	17.5	+3						
				35.5	41.5	+6						
J.S.	7-2	1	--	4	3	-1	L.P.	L.P.	2/560	2/560	2/560	2/560
				6	5	-1						
				0	2	+2						
				10	10	0						
B.H.	9-7	3	111	5	3	-2	L.P.	L.P.	not measurable	3/560	none	3/560
			WISC	5	3	-2						
				0	6	+6						
				10	12	+2						
D.B.	12	4	--	10	11	+1	HM	HM	4/560	4/560	6/280	6/280
				20	23	+3						
				19.5	19	- .5						
				49.5	53	+3.5						

APPENDIX A
Control

Name	Age	Grade	IQ	Pre	Post	Difference	Distance Vision r	Distance Vision l	Near Vision Before r	Near Vision Before l	Near Vision After r	Near Vision After l
M.M.	6-11	1	--	9	11	+2	NLP	CF 1'	None	2/560	None	3/560
				17	19	+2						
				15.5	14.5	-1						
				41.5	44.5	+3						
R.B.	11-6	4	114	10	9	-1	L.P.	L.P.	3/140	None	J 14 @ 2"	J-0
				22	21	-1						
				21.5	23	+1.5						
				53.5	53	- .5						
M.H.	12-2	5	100	9	11	+2	CF 2'	CF 2'	(L) 20/400 line at 9'		20/400	2 at 6
				19	20	+1						
				20.5	22	+1.5						
				48.5	53	+4.5						
B.H.	10-11	3	near top of 90-110 range	4	4	0	L.P.	L.P.	20/800 at best		little more than L.P. hard to say	
				2	4	+2						
				3	4	+1						
				9	12	+3						
D.M. (how learned to read print?)	11-11	4	near top of 90-110 range	10	10	0	HM	HM	(L) 20/400 line at 6'		20/200 2 at 3'	
				18	19	+1						
				12	21.5	+9.5						
				40	50.5	+10.5						

APPENDIX B

Materials Used in Visual Stimulation Program

It should be noted that the following materials, which made up the teaching kit, were selected for their pertinence, availability and (where possible) moderate price. Teachers were urged to supplement the kit with other materials whenever necessary or desirable. Related materials not listed will occur to many readers and likely would be equally appropriate. The Initial cost of the kit is approximately $120.00.

Benton Review Publishing Company, Inc. - Fowler, Indiana:
- Match Me (a reading readiness game)

Milton Bradley - Springfield, Massachusetts:
- Picture Word Builder
- Sentence Builders

The Continental Press, Inc. - Elizabethtown, Pennsylvania:
- Pre-printed masters (for liquid duplicators) pertaining to
  - Kindergarten Catalog
    - Swing Things (Levels one and two)
  - Reading Readiness Catalog
    - Rhyming (Levels one and two)
    - Visual Discrimination (Levels one and two)
    - Thinking Skills (Levels one and two)
    - Individual Activities (Level one)
  - Exceptional Children Catalog
    - Measurement (Level one)
    - Useful Language (Level one)

Creative Playthings, Inc. - Princeton, New Jersey:
- Inset Cylinders (three different sets) - AT 620, AT 621, AT 622
- Wonder Texture Box - AA 810
- Geometric Insets - AJ 114
- Perception Plaques (two different sets) - AA 389, AA 390
- Picture Dominoes - AA 350
- Go-Together Cards - AA 308
- Ben-G Reading Readiness Puzzles (all four) - AA 729
- Graded Circles, Squares, Triangles - AN 100

Dennison Manufacturing Company - Boston, Massachusetts
- Colorcraft Paper

Ed-U-Cards Manufacturing Corporation - Long Island City, New York:
- Object Lotto
- The World About Us

Garrard Publishing Company - Champaign, Illinois:
Picture Readiness Game
Match Sets, One and Two
Sight Phrase Cards
Basic Sight Vocabulary Cards
Popper Words, Sets One and Two
Basic Sight Word Test
Read and Play Books (paperback)

Instructor Products Company - Philadelphia, Pennsylvania:
Opposite Concepts